

WHAT IS CLAIMED:

1 1. A shaft mountable member for mounting on a rotatable shaft and
2 adjacent a face of a second member, the shaft mountable member comprising:
3 a body portion defining a first side, a second side, and a bore extending
4 between the first and second sides for receiving the shaft therethrough,
5 wherein the first side defines a plurality of grooves extending radially
6 between the bore and an outer perimeter of the first side, each of the grooves
7 providing a fluid passage between the bore and the outer perimeter such that fluid
8 is communicated between the bore and the outer perimeter through the grooves
9 without generating significant thrust loading on the second member.

1 2. A shaft mountable member according to Claim 1 wherein the
2 second side defines a plurality of grooves extending radially between the bore and
3 an outer perimeter of the second side, each of the grooves on the second side
4 providing a fluid passage between the bore and the outer perimeter such that fluid
5 is communicated between the bore and the outer perimeter through the grooves on
6 the second side when the second side is positioned adjacent a third member
7 without generating significant thrust loading on the third member.

1 3. A shaft mountable member according to Claim 1 wherein the shaft
2 mountable member is a bearing.

1 4. A shaft mountable member according to Claim 1 wherein the first
2 side defines at least 15 of the radial grooves.

1 5. A shaft mountable member according to Claim 1 wherein each
2 radial groove has a depth of less than about 0.025 inches.

1 6. A shaft mountable member according to Claim 1 wherein the
2 combined cross-sectional area of the grooves is at least about 0.003 square inches.

1 7. A shaft mountable member according to Claim 1 wherein the
2 grooves are formed by pressing a die against the shaft mountable member, the die
3 defining a contoured surface corresponding to the shape of the grooves.

1 8. A turbocharger comprising:
2 a center housing defining a cavity therethrough and a fluid passage in
3 communication with the cavity;
4 at least one bearing positioned in the bore of the center housing, the bore
5 defining first and second opposite faces and defining a bore therethrough;
6 a rotatable shaft extending through the bore of the bearing and defining
7 first and second ends at opposite sides of the center housing;
8 a compressor connected to the first end of the shaft and configured to
9 rotate with the shaft, the compressor defining a face adjacent the first face of the at
10 least one bearing;
11 a turbine connected to the second end of the shaft and configured to rotate
12 with the shaft and the compressor, the turbine defining a face adjacent the second
13 face of the at least one bearing;
14 wherein at least one of the faces of the bearing defines a plurality of
15 grooves extending radially between the bore and an outer perimeter of the bearing,
16 each of the grooves providing a fluid passage between the bore and the outer
17 perimeter such that fluid is communicated between the bore and the outer
18 perimeter through the grooves without generating significant thrust loading on the
19 adjacent one of the compressor and turbine.

1 9. A turbocharger according to Claim 8 wherein the second side
2 defines a plurality of grooves extending radially between the bore and an outer
3 perimeter of the second side, each of the grooves on the second side providing a

4 fluid passage between the bore and the outer perimeter such that fluid is
5 communicated between the bore and the outer perimeter through the grooves on
6 the second side when the second side is positioned adjacent a third member
7 without generating significant thrust loading on the third member.

1 10. A turbocharger according to Claim 8 wherein the first side defines
2 at least 15 of the radial grooves.

1 11. A turbocharger according to Claim 8 wherein each radial groove
2 has a depth of less than about 0.025 inches.

1 12. A turbocharger according to Claim 8 wherein the combined cross-
2 sectional area of the grooves is at least about 0.003 square inches.

1 13. A turbocharger according to Claim 8 wherein the grooves are
2 formed by pressing a die against the bearing, the die defining a contoured surface
3 corresponding to the shape of the grooves.

1 14. A turbocharger according to Claim 8 wherein two of the bearings
2 are positioned on the shaft with a spacer on the shaft therebetween, each of the
3 bearings defining a plurality of the grooves on a respective face.

1 15. A turbocharger according to Claim 14 wherein each of the bearings
2 defines a plurality of the grooves on each face thereof.

1 16. An elongate shaft for receiving a relatively rotatable member, the
2 shaft comprising:
3 a first portion having an outer surface defining a first diameter, the first
4 portion being configured for receiving the rotatable member;

5 a second portion having an outer surface defining a second diameter larger
6 than the first diameter, the second portion being adjacent the first portion;
7 a shoulder surface extending radially between the outer surfaces of the first
8 and second portions, the shoulder surface defining a plurality of grooves
9 extending radially between the outer surfaces of the first and second portions,
10 each of the grooves providing a radial fluid passage between the shoulder surface
11 and the relatively rotatable member such that fluid is communicated through the
12 grooves without generating significant thrust loading between the shoulder surface
13 and the relatively rotatable member.

1 17. A shaft according to Claim 16 wherein the shoulder surface defines
2 at least 15 of the radial grooves.

1 18. A shaft according to Claim 16 wherein each radial groove has a
2 depth of less than about 0.025 inches.

1 19. A shaft according to Claim 16 wherein a combined cross-sectional
2 area of the grooves is at least about 0.003 square inches.

1 20. A shaft according to Claim 16 wherein the grooves are formed by
2 pressing a die against the shoulder surface, the die defining a contoured surface
3 corresponding to the shape of the grooves.

1 21. A method for manufacturing a shaft mountable member for
2 mounting on a shaft and adjacent a face of a second member, the method
3 comprising:
4 providing the shaft mountable member defining a first side, a second side,
5 and a bore extending between the first and second sides for receiving the shaft
6 therethrough;

7 providing at least one die having a contoured surface defining a plurality
8 of ridges thereon; and
9 urging the die against the first side of the shaft mountable member and
10 thereby forming a plurality of grooves in the first side, each groove extending
11 radially between the bore and an outer perimeter of the first side.

1 22. A method according to Claim 21 further comprising urging the at
2 least one die against the second side of the shaft mountable member and thereby
3 forming a plurality of grooves in the second side, each groove extending radially
4 between the bore and an outer perimeter of the second side.

1 23. A method according to Claim 21 wherein said first providing step
2 comprises providing a bearing.

1 24. A method according to Claim 21 wherein said urging step
2 comprises forming at least 15 of the radial grooves on the first side.

1 25. A method according to Claim 21 wherein said urging step
2 comprises forming each radial groove to have a depth of less than about 0.025
3 inches.

1 26. A method according to Claim 21 wherein said urging step
2 comprises forming the radial grooves on the first side to have a combined cross-
3 sectional area of at least about 0.003 square inches.

1 27. A method for circulating a lubricant between a shaft member on a
2 shaft and an adjacent face of a second member, the method comprising:
3 providing the shaft member on the shaft, the shaft member defining a first
4 side, a second side, and a bore extending between the first and second sides for
5 receiving the shaft therethrough;

6 providing the second member adjacent the first side of the shaft member;
7 and
8 circulating a fluid radially through a plurality of grooves on the first side
9 of the shaft member between the bore and an outer perimeter of the first side such
10 that the fluid is communicated between the bore and the outer perimeter through
11 the grooves without generating significant thrust loading between the shaft
12 member and the second member.

1 28. A method according to Claim 27 further comprising providing a
2 third member adjacent the second side of the shaft member, and circulating the
3 fluid radially through a second plurality of grooves on the second side of the shaft
4 member between the bore and an outer perimeter of the second side such that the
5 fluid is communicated between the bore and the outer perimeter of the second side
6 through the second plurality of grooves without generating significant thrust
7 loading between the shaft member and the third member.